Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.



UNITED STATES DEPARTMENT OF AGRICULTURE

COMMODITY STABILIZATION SERVICE

STUDY OF FARM MACHINERY AND EQUIPMENT REPLACEMENT NEEDS

MAY 1955

UNITED STATES DEPARTMENT OF AGRICULTURE LIBRARY



Page BOOK NUMBER General Progress in Med Composition of Methodology Use Requirements The Replacement Needs Effect of Technological Developments Summary Sheet Charts Wheel Tractors Garden Tractors Sprayers and Dusters Dairy Equipment Tractor Moldboard Plows Disc Harrows Manure Spreaders Tractor Cultivators Combines (Pull-Type), 6 ft. and Under Combines (Pull-Type), over 6 ft. Combines -- Self-Propelled Corn Pickers Hay Rakes Pick-up Balers Other Items Domestic Water Systems Farm Elevators Transportation Equipment (not Motor) Silos Machines not Elsewhere Classified

TABLE OF CONTENTS

		Pag	
Gen	eral		
	Progress in Mechanization Composition of Domestic Needs Methodology Used in Determining Replacement	1	
	Requirements The Replacement Needs Effect of Technological Developments	1 2 2	
Sum	mary Sheet	3	
Char	rts		
	Wheel Tractors Garden Tractors	456	
	Sprayers and Dusters Dairy Equipment	6 7 8	
	Tractor Moldboard Plows Disc Harrows Manure Spreaders	9	
	Tractor Cultivators Combines (Pull-Type), 6 ft. and Under	11 12	
	Combines (Pull-Type), over 6 ft. Combines Self-Propelled	13	
	Corn Pickers Mowers Hay Rakes	15 16 17	
	Pick-up Balers Other Items	18	
	Domestic Water Systems Farm Elevators	20	
	Transportation Equipment (not Motor) Silos Machines not Elsewhere Classified	22 23 2h	

3 STUDY OF FARM MACHINERY AND EQUIPMENT REPLACEMENT NEEDS

24.8.

工



A Farm Machinery and Supplies Staff Report -- Prepared by F. M. Johnson, Food and Materials Requirements Division, Commodity Stabilization Service. U. S. Department of Agriculture

During both World War II and the Korean War, the Department of Agriculture acted as claimant agency for farm machinery and equipment under the controlled materials allocation plans. The Department's primary responsibility consisted of establishing requirements data on farm machinery and equipment headed to produce essential food and fiber.

In connection with its present mobilization planning responsibilities, the Department has developed information on the quantity of farm machinery and equipment needed by American farmers to produce adequate quantities of food and fiber under emergency conditions. It would be impossible to provide a precise set of requirements figures for every possible contingency which might arise. Therefore, as a starting point, a comprehensive study was made of the composition of the farm machinery and equipment market as it is today and particularly the basic element -- the replacement -- as projected over the next five years.

Progress in Mechanization

Farm machinery and equipment are as necessary to agricultural production as machine tools are to the output of metal fabricated products. Farmers, like manufacturers, cannot meet competition with the hand labor methods used 20 or 30 years ago. Machinery not only is needed to save man-hours of labor, an important consideration in view of the steadily diminishing farm labor force, but also to increase productivity per man-hour. Today, largely because of machinery, one farm worker can produce enough to feed himself and 18 other people, as compared with the situation 30 years ago when one worker could grow only enough to feed himself and 7 others.

Considerable progress has been made in the last 30 years in the mechanization or tooling up of our agricultural plant. Wheel tractors on farms since 1925 have increased from roughly one-half million to approximately i million today. In addition, there is in excess of another one-half million garden and crawler tractors on farms. This increase in prime power has been accompanied by a corresponding decrease in the farm labor force and horse and mule

population. Supplementing this increase in basic power have been a number of labor-saving machines, such as the combine, corn picker, cotton picker, and many others. The present level of mechanization on farms has contributed during this 30-year period to the reduction of almost 50% in labor input per unit of production of all crops combined.

Composition of Domestic Needs

The present needs for farm machinery and equipment can be divided roughly into two component parts.

The first might be called replacement needs. This part would consist of the quantity necessary to replace obsolete and worn-out equipment and in general to maintain the mechanical efficiency of our agricultural plant at today's level.

The second part, consisting of equipment which adds to the present mechanical efficiency, might be divided into two segments. The first segment would consist of items of equipment incorporating recent technological advances and coming into quantity production since World War II. In this grouping would be such items as cotton harvesting machinery, forage harvesters, pick-up balers, self-propelled combines, automatic poultry feeders, automatic barn cleaners, and portable irrigation equipment. The second segment might be called additional mechanization of types of equipment involving older technological developments. These two segments would include machinery not only for increasing the present mechanical efficiency of our agricultural plant but also machinery needed to fit the shifting of acreage from one crop to another.

Thirty years ago the farmer's needs for equipment consisted almost wholly of items to be used for additional mechanization. In other words, practically all machinery was purchased as a substitute for manpower and horse and mule power. Since that time the need for replacing machines with machines rather than manpower and animal power by machines has become increasingly greater. For example, the study shows that in 1952 approximately 15 percent of the new items of farm machinery and equipment sold replaced obsolete and wornout equipment. During that year items involving recent technology represented approximately 19 percent of end items while items representing older technology accounted for approximately 36 percent. This shift continued in 1953, when almost 18 percent of the production was sold for replacement purposes, with slightly over 20 percent for recent technology items and 32 percent for older technology.

Methodology Used in Determining Replacement Requirements

Several approaches were tried and tested in developing replacement requirements. The method finally used consisted in general of super-imposing a disappearance curve on the figures for annual domestic shipments of the various items of farm machinery and equipment. The disappearance curve itself was devised by

- 2 -

ting the population by years from the actual annual sales. After the characteristics of the disappearance curre were established, it was proportioned to the effective average life of each item before application to the various sales patterns. In the graphs following the text are shown the sales patterns and replacement projections by years through 1960.

The Replacement Needs

The increasing importance of the replacement needs for farm machinery and equipment as a component part of the total needs is shown in the weighted summary sheet. Using 1952 as a base year, there would be need to replace wornout equipment in 1955, a quantity of farm machinery and equipment equal to 53.3 percent of the base year, and this percentage would increase year by year until in 1960 there would be needed 95.3 percent of base production for this purpose alone. The increasing rate of need for replacement equipment will continue through 1958, with a slight tapering-off in the rate of increase during 1959 and 1960.

A review of the individual replacement requirements indicates to some extent the relative level of mechanization and average age for each of the items or groupings of items. Domestic tractor shipments for the period 1935 through 1945 averaged slightly over 150,000 units per year. Following that period, substantial increases were made until the peak of slightly over 450,000 was reached in 1951. In subsequent years shipments dropped from this peak. It is evident from this graph that a substantial part of our population of 4 million tractors today is made up of tractors produced during the period 1947 through 1952. As a consequence, replacement requirements during the period 1953 through 1956 are rather stable, at approximately 200,000 units peryear. As the bulk of the tractor population becomes older, replacement needs increase substantially until in 1960 there will be needed production of tractors at slightly above the 1952 rate in order to maintain our present level of tractor power.

The shipments of garden tractors through World War II were at a relatively low level. Following World War II, however, shipments skyrocketed until in 1953 over 200,000 units were shipped to domestic farmers. Again, the bulk of the garden tractor population is comprised of production subsequent to 1947, and as a consequence replacement requirements are relatively low at this time but are increasing rapidly until in 1960 there will be needed 81 percent of 1952 base production to maintain the present population.

Shipments of dairy equipment from 1923 until just prior to the start of World War II remained relatively constant. During World War II the mechanization of dairy production increased very rapidly. Following World War II shipments tapered off. Replacement requirements today are running somewhat under the 1952 level but by 1960, when the bulk of the replacements will be needed for those units sold during the World War II period, requirements will increase to approximately 150 percent of the 1952 level.

The combine charts are divided into three parts: pull-type, 6 feet and under; pull-types over 6 feet; and self-propelled combines. These should be

considered as a whole, since there has been substantial shifting in preference between the pull type and the self-propelled type. The shipment of small pull-type combines peaked in 1950 with a subsequent drop-off in shipments. Replacement requirements, partially as a result of a low base shipment in 1952, would be at an 87 percent level, with an increase to 137 percent in 1960. The shipment of large pull-type combines peaked in 1950, with decreases through 1952 and an increase in 1953. Again, as a consequence of the low base in 1952, the percentage requirements are relatively high with approximately 125 percent of 1952 production needed this year and increasing to 185 percent in 1960 in order to maintain the break-even point. The shipment of self-propelled combines was relatively inconsequential until the latter part of World War II, when production increased sharply and this increase continued alamost uninterruptedly through 1952. As a consequence of the bulk of the self-propelled combine population being manufactured since 1947, replacement requirements are relatively low today but increase to 73 percent of base production in 1960.

The population of corn pickers on farms is similar to the age pattern of several other items, with the bulk of the population built since 1947. As a consequence, replacement requirements have not come into full play as yet, with 1955 needs being approximately 70 percent of a relatively low 1952 base. The replacement rate increases through 1958, with a slight tapering-off after until 1960, when requirements will be approximately 135 percent of base.

The pick-up baler is a relatively new item of equipment which has come into quantity production since World War II. Again as a consequence, replacement requirements, percentage-wise, are relatively low because of the newness of the present population and a relatively high base, with requirements for this year equaling 27 percent of the 1952 base but increasing to 83 percent in 1960.

The farm elevator chart is illustrative of an item which, although produced over a number of years, did not come into volume production until following World War II, at which time shipments increased by several hundred percent over the average of previous years. The bulk of the elevator population today is made up of equipment built since 1917. With a relatively high base in 1952, replacement requirements will be only 15 percent in 1955, but ascend to 12 percent in 1960.

Effect of Technological Developments

In developing the replacement figures, no weight was given to such factors as shifts and changes in acreage of various crops, technological advances in different kinds of machinery, or the substitution of new types of machinery for other types in order to better fit changes in agricultural production methods. The projections in general will be the replacement needs over the next few years to keep our agricultural plant at its present level of mechanical efficiency.

As new machinery shipment and production figures are obtained, they will be incorporated in the projections. It is not expected, however, that the impact of new figures will materially change the projections on a short-range besis. The replacement needs were initially projected incorporating shipment information up to 1952. Since that time the shipment information for 1952 and 1953 has become available and has been incorporating this new shipment information, were inconsequential and amounted to less than one percent.

930586

SUMMARY SHEST FARM MACHINERY AND SQUIPSENT REPLACEMENT RESULTEMENTS FOR SPECIFIED YEARS AND RELATED DATA

Item and Code		Domestic Shipments for 1952 1/								Fiscal Year Replacement Requirements											
						Percent of 1		52			Value in	Terms of	1952 Dolla:	rs				Number of Units			
				• 1955	1956	1957	1958			1955	1956	1937	1958	1959	1960	1955	1956	1957	1958	1959	1960
No.	Description	\$1,000	Number	:																	
21191 21213 21224 21228 22094 612 63,592 99091 16210 52091 91091 229	Sheel Tractors Garden Tractors Sprayers & Dusters Dairy Equipment Edg Code Domestic alter Systems Farm Elevators Sillo Construction Portable Pipe & Ftgs. 2/ Horseshoes Machines N.E.C.	L51,057 27,34h 26,596 11,911 651,056 69,817 25,461 22,063 17,283 29,000 491 68,593	347,806 197,540 - - 95,890 12,997	56.4 35.1 62.7 87.5 49.1 54.7 14.6 19.0 43.4 53.3 84.6 86.8	59.9 50.8 76.0 94.3 55.6 62.8 17.9 54.2 44.2 59.0 77.8 92.0	68.0 65.1 92.4 103.4 64.4 73.8 22.0 61.2 46.0 67.6 98.0	78.8 72.7 108.4 115.3 74.4 84.2 27.2 70.9 48.6 77.6 65.9 104.3	91.1 76.6 119.7 131.4 83.2 91.3 33.8 83.8 51.9 87.2 60.6 110.2	102.6 80.8 122.2 149.5 89.8 93.9 42.1 99.1 55.9 95.3 55.8 115.8	254,396 9,598 16,667 10,482 339,606 38,221 3,720 10,818 7,501 15,457 h15 59,513	270,183 13,891 20,21h 11,235 362,052 h3,830 h,561 11,959 7,639 17,110 382 63,110	306,719 17,801 24,582 12,326 419,588 51,494 5,606 13,528 7,950 19,604 352 67,194	355, h33 19,879 28,827 13,745 484, h15 58,765 6,931 15,654 8, h00 22,504 324 71,518	410,913 20,945 31,852 15,648 541,594 63,770 8,613 18,502 8,970 25,288 298 75,585	462,78h 22,09h 32,507 17,807 58h,706 65,576 10,728 21,888 9,661 27,637 27h 79,h07	196,222 69,397 	208,466 100,384 - - 17,144 5,746	236,575 128,579 	27h,171 1h3,711 - - 26,059 - 6,317	316,719 151,357 - - - 32,389 - 6,751	356,714, 159,552
	Totals	1,400,712		53.3	59.0	67.6	77.6	87.2	95.3	746,334	826,166	946,744	1,086,395	1,221,978	1,335,069	-	-	-	-	-	-
					40.4					No. 22094			25 903	20, 229	32,590	136,388	142,857	160,247	192 025	209,092	232,372
P.T.((S.P.	Tractor Nid. Flows Jisc Harrows Manure Spreaders Tractor Cultivators Combines - 6' & Under Combines - 6' & Under Combines - All Sizes Com Pickers Cotton Harvesters Mowers Hay Rakes Flak-Up Balers Other Items	31,590 38,912 24,833 34,766 46,264 9,686 46,345 18,737 27,593 28,070 22,820 99,186 192,264	225,070 222,097 90,909 239,326 h6,292 6,337 1h,278 57,h71 - 166,h76 113,710 67,942	60.6 53.3 53.1 67.1 87.0 125.3 22.5 70.2 49.1 79.9 62.3 27.0 36.0	63.5 58.8 55.4 71.6 99.0 137.4 30.8 88.2 55.6 91.3 66.8 35.5 37.8	71.2 68.7 57.4 78.3 112.4 154.2 41.4 107.1 64.4 106.8 74.8 47.7 40.8	81.7 80.3 59.3 86.4 126.0 173.1 54.0 124.7 74.4 119.7 83.8 61.9 45.3	92.9 94.2 61.1 95.6 135.6 184.7 65.0 134.0 83.2 123.9 92.5 74.0 51.4	103.2 105.0 65.2 103.5 137.4 185.4 73.1 135.3 89.8 121.2 99.9 83.0 59.2	19,137 20,710 13,186 23,328 10,250 12,136 10,128 31,213 13,548 22,128 11,217 26,780 69,215	20,053 22,880 13,757 24,892 45,801 13,308 14,274 42,986 15,342 25,628 15,244 35,211 72,676	22, la5 26,732 1h, 25h 27, 222 52,001 1h, 936 19,187 52,197 17,770 29,979 17,069 47,312 78, lihh	25,801 31,246 14,726 30,038 58,293 16,766 25,026 60,775 20,529 33,600 19,123 61,398 87,096	29,338 36,655 15,173 33,306 62,73h 17,890 30,12h 65,308 22,957 34,779 21,108 73,398 98,82h	40,858 16,191 35,983 63,567 17,958 33,878 65,911 24,778 31,021 22,797 82,324 113,820	133,036 123,652 48,308 160,661 40,267 7,943 3,213 40,364 133,013 70,895 18,376 69,244	136,417 50,385 171,430 45,842 8,708 4,401 50,707 151,949 75,924 24,093 72,639	159,402 52,142 187,374 52,046 9,774 5,907 61,553 177,759 85,109 32,401 78,444	183,935 186,460 53,921 206,939 58,355 10,971 7,703 71,655 199,236 95,329 42,056 87,100	218,618 55,580 229,385 62,767 11,704 9,283 77,026 206,345 105,138 50,317 98,889	243,648 59,254 247,796 63,617 11,752 10,439 77,759 201,814 113,630 56,362 113,766
	Total for Code	651,056	- 1	49.1	55.6	64.4	74.4	83.2	89.8	319,606	362,052	419,588	484,415	511,594	584,706	-	-	-	-	-	
									weig	hted Averag	es										
	Wheel Tractors All Other Mchry. & Eqpt. All Mchry. Incl. Tractors	451,057 949,655 1,400,712	347,806	56.4 51.8 53.3	59.9 58.5 59.0	68.0 67.4 67.6	78.8 77.0 77.6	91.1 85.4 87.2	102.6 91.9 95.3	254,396 491,964 746,334	270,183 555,979 826,166	306,719 640,052 946,744	355,433 730,986 1,086,395	410,913 811,069 1,221,978	462,784 872,308 1,335,068	196,222	208,466	236,575	274,171	316,719	356,714

^{1/} Horseshoes are estimates based on National Production Authority allocations @ \$120.00 per ton, and Fortable Pipe and Fittings is based on approximate production \$ \$1.00 per pound of aluminum.

^{2/} Replacement requirements were not calculated. Figures represent approximate average for all other machinery and equipment.

^{3/} Replacement requirements were determined by projecting the average rate of decline in horse and mule population, 8 percent per year, from 1952.















































